OBSTETRICAL ULTRASOUND EXAMINATION
2nd/3rd TRIMESTER

POLICY: Obstetrical ultrasound will be performed with an order from a physician or other qualified clinical practitioner. The examination will be supervised and interpreted by a radiologist or other licensed practitioner who is qualified by reason of training to recognize normal and abnormal maternal and fetal anatomy, understand the pathophysiology of pregnancy, and integrate the patient’s clinical circumstances and ultrasound findings to optimize the probability of accurate diagnosis.

PURPOSE: To assess the status of a pregnancy in the 2nd and 3rd trimester and document normal and abnormal findings.

INDICATIONS: Obstetric ultrasound is indicated in some circumstances for uncomplicated 2nd and 3rd trimester pregnancies (e.g. estimation of gestational age, measurement of fetal growth, suspected multiple gestations, determination of fetal position) or for pregnancy complications (e.g. small- or large-for-dates, vaginal bleeding, suspected fetal death, premature rupture of membranes, or preterm labor). Known or suspected fetal abnormalities (e.g. abnormal maternal serum screening, family history of congenital anomaly, advanced maternal age, abnormal fetal movement, or adjunct to amniocentesis) are appropriate indications for 2nd and 3rd trimester obstetric ultrasound, as are maternal conditions (e.g. abdominal or pelvic pain, pelvic mass, known or suspected cervical insufficiency, diabetes, hypertension, or teratogen exposure). This list of indications is not comprehensive and the decision to perform prenatal ultrasound is best determined by the primary obstetric practitioner.

PATIENT PREPARATION: There is no special preparation for this examination. Patients should be instructed to take prescribed oral or injectable medication on their normal schedule.

PROCEDURE: With infrequent exceptions (noted below), the examination will be performed from a transabdominal approach. For every image that includes measurements, excluding biometry images, an identical image should be captured with calipers removed. The elements of the examination are defined by the AIUM Practice Guidelines for the Performance of Obstetric Ultrasound (revised 2018). The elements and order of imaging for the complete examination are listed below, with the minimal number of images in parenthesis.

Panoramic examination (11 images)
- Maternal uterus and cervix
- Maternal adnexa/ovaries
- Fetal position
- Placenta
- Amniotic fluid
Fetal Biometry (8 images)
- Biparietal diameter
- Head circumference
- Abdomen circumference
- Femur length
- Estimation of fetal weight

Fetal Anatomy (30 images & 2 cines)
- Head
- Face (1 image, 1 cine)
- Brain
- Spine
- Heart (5 images, 1 cine)
- Stomach
- Kidneys
- Bladder
- Umbilical cord vessels and insertion sites
- Extremities

Fetal biometry will be recorded on off-line computerized obstetric reporting software (e.g.: Viewpoint) to calculate estimates of gestational age and weight. When available, computerized obstetric reporting software (e.g.: Viewpoint) should be used to report fetal anatomy, maternal structures, and any abnormalities identified.

**PANORAMIC VIEW**
Panoramic images are intended to demonstrate the uterine contour, uterine abnormalities (e.g. duplication anomalies, fibroids), fetal position, situs, the placenta and the placental-cervix relationship and amniotic fluid volume. An accurate measurement of the cervix cannot be performed until the gestational sac is distended enough to provide fluid opposing the internal os, defining cervix (approximately 16 weeks). The maternal ovaries/adnexa are also routinely evaluated for abnormalities on a complete 2\textsuperscript{nd}/3\textsuperscript{rd} trimester exam.

Minimal stored images should include:
- Two long axis views of the cervix labeled Long Cervix, to demonstrate the entire endocervical canal, internal and external cervical os and position of the placenta (if visible in the lower uterine segment) relative to the cervix. These images must be obtained without excessive bladder filling or uterine contractions. The fetus must be displaced from the lower uterine segment to allow amniotic fluid to oppose the internal os. The cervix will be measured from the internal os to the external os on one image.

*Note: Prior to 26 weeks gestation, if transabdominal evaluation of the cervix is suboptimal and/or a reliable measurement cannot be obtained, then an endovaginal evaluation of the cervix should be performed (this may be omitted if a normal cervix has already been documented on an OB 2/3 examination earlier in the pregnancy). However, after 26 weeks, endovaginal evaluation of the cervix is not necessary when the risk is not elevated. A careful endovaginal evaluation is indicated when the patient is at elevated risk for cervical complications*; this applies to the initial 2nd/3rd trimester exam, as well as all subsequent exams up to 32 weeks. Although evaluation of the cervix is not required after 32 weeks gestation, a transabdominal attempt should still be made. Endovaginal evaluation of the cervix may be performed at any gestational age if specifically requested by the referring provider.
Endovaginal evaluation of the cervix is indicated in any of the following circumstances (up to 32 weeks):

- abnormal transabdominal evaluation
- uncertain placental-cervix relationship
- abnormal cervix on prior OB 2/3 exam
- cervical incompetence/preterm labor
- ant low-lying placenta and hx c-section
- hx cervical incompetence
- hx preterm labor/delivery (<37wks)
- hx cervical procedure (LEEP, biopsy, cerclage, etc.)
- at the request of the ordering provider

- Three long axis views of the uterus, labeled Long Rt, Long ML, and Long LT. One image should be optimized to display the fundus and one image optimized to demonstrate the position of the placenta relative to the internal cervical os.
- Three transverse views of the uterus labeled Trans Sup, Trans Mid, and Trans Inf, to demonstrate the lateral uterine walls, fetal position and placental position.
- Long and short axis images of each ovary should be obtained and labeled Long Rt/Lt Ovary and Trans Rt/Lt Ovary as appropriate. If visualization of the ovaries is adequate, three orthogonal dimensions should be measured. If the ovaries are not reliably visualized, one representative long or short axis image of the adnexa should be obtained and labeled Long or Trans Rt/Lt Adnexa, as appropriate.
- A qualitative assessment of amniotic fluid will be performed in all obstetrical examinations. In pregnancies at or beyond 25 weeks, the amniotic fluid index will be documented. A focused image of each quadrant of the uterus will be obtained, in either longitudinal or transverse planes, to include the largest vertical pocket of amniotic fluid and labeled RUQ, LUQ, RLQ, or LLQ, as appropriate. The amniotic fluid pocket in each quadrant will be measured to exclude the umbilical cord (color Doppler should be utilized to improve visualization of the cord) and fetal parts, and added to the measured pocket in each of the other quadrants to arrive at the amniotic fluid index. Measured pockets of fluid should be at least 1-2cm in width. Quadrants without perceptible amniotic fluid will be imaged and labeled.

FETAL BIOMETRY

Specified fetal structures will be imaged and measured to generate a composite or average estimate of gestational age. Multiple images and measurements of all structures will be obtained, and the sonographer will select the best measurement of each structure for inclusion in the composite or average age. The measured value of each structure will be recorded in the computerized obstetric reporting software to generate the estimate of gestational age and fetal weight. Structures that cannot be reliably imaged and measured will be excluded from the composite or average gestational age calculation.

The variability of gestational age determination increases as the pregnancy advances. Whenever possible, the pregnancy dating will be assigned based on the earliest 1st trimester (with heart motion) crown-rump length (CRL). If unavailable, then an early pregnancy gestational sac measurement should be used. If there is no 1st trimester ultrasound available, then the earliest 2nd/3rd trimester (with heart motion) measurements should be used to calculate the gestational age and assign dating.

Fetal growth in the 2nd/3rd trimester will not be assessed at an interval of less than two weeks; the variation inherent in biometric assessment makes short interval detection of growth abnormalities unreliable. Biometric measurements and fetal growth assessment are routinely performed on follow up examinations at an interval at least four weeks.
Minimal stored images shall include:

- Two images of the biparietal diameter (BPD) obtained from a lateral (parietal) approach in a transverse plane that includes the thalami and cavum septi pellucidi. The BDP will be measured at the widest point of the skull from the outer table of the calvarium closest to the transducer to the inner table of the calvarium furthest from the transducer.
- Two images of the head circumference (HC) obtained at the same level of the fetal head as used for measurement of the BPD. The HC will be measured in two dimensions at the outer table of the calvarium to include the longest (occipitofrontal) and orthogonal diameters, or with the ellipse tool available on the ultrasound machine;
- Two images of the abdominal circumference (AC) obtained in a transverse plane of the abdomen to include the junction of the portal sinus and intraabdominal umbilical vein. The AC will be measured at the skin surface in two dimensions to include the longest and orthogonal diameters, or with the ellipse tool available on the ultrasound machine;
- Two images of the femur nearest the transducer oriented such that its long axis is perpendicular to the ultrasound beam. (If the near field femur cannot be reliably imaged, the opposite femur can be used for measurement.) The femur measurement will include the longest calcified (diaphyseal) dimension, excluding any specular reflection of the distal epiphysis.

FETAL ANATOMY

All complete 2nd and 3rd trimester obstetric ultrasound examinations will include a “screening” survey of fetal anatomy to identify normal structures and demonstrate common fetal malformations. It is not the intention of the “screening” anatomic survey to identify all fetal structures and/or malformations, nor characterize in any detail malformations that may be encountered. All structures included in these minimal requirements (detailed below) will be classified as 1) adequately visualized and within normal limits (WNL), 2) adequately visualized and abnormal, 3) not well visualized, or 4) not examined. Normal fetal structures that are not included in the minimal requirements can be imaged if encountered during the course of a standard examination. All abnormal fetal structures identified by the sonographer, whether required or not, shall be imaged.

Minimal stored images shall include:

- **Head**: Images of the fetal head shall demonstrate the calvarium, its echogenicity, and contour. The frontal, parietal, and occipital segments shall be included; the crown may not be imaged because of fetal position. Images of the BPD, HC, and intracranial structures that also adequately demonstrate the calvarium are sufficient for documentation of the fetal head.
- **Face**: Documentation of the fetal face will include at least one coronal (tangential) view of the nose and upper lip and a cine clip in the same plane from anterior to posterior. The image(s) and cine shall be labeled *Nose/Lips*. A profile view of the fetal face may be obtained but is not required. Profile views captured must
demonstrate a fetal nasal bone (if present) and fetal chin contour. Profile views that are slightly off the sagittal midline may artifactually create the appearance of micrognathia, absent/shortened nasal bone, or other problems.

- **Brain:** Images of the fetal brain shall include at least one image of the midline falx and cavum septi pellucidi (images of the BPD and HC that adequately demonstrate the falx and cavum septi pellucidi are satisfactory for documentation.) At least two images will be recorded from the lateral (parietal) approach to include the lateral ventricle, ventricular atrium, and occipital horn and labeled *Ventricle*. The ventricular atrium will be measured in one image at the posterior margin of the choroid plexus, perpendicular to the long axis of the ventricle, from its medial to lateral walls. At least two images of the posterior fossa from a lateral (parietal) approach will include the cerebellum at its widest transverse diameter and the cisterna magna and labeled *Posterior Fossa, Cisterna Magna or Cerebellum* as appropriate. The transverse cerebellar diameter and cisterna magna can be measured in one image, but measurements are not required.

- **Spine:** The cervical, thoracic, lumbar and sacral segments of the fetal spine shall be imaged in long and transverse planes. The spine should be imaged when it is exposed to the examining transducer without intervening fetal tissues (i.e. fetal prone position) and when amniotic fluid is interposed between the fetus and uterine wall to optimize visualization of the fetal skin. Long axis view should be obtained to image as much of the complete length of the spine as possible and labeled *Long Spine*. Representative transverse images of the cervical, thoracic, lumbar, and sacral segments shall be obtained and labeled *Trans Spine C, T, L or S*, as appropriate.

- **Heart:** Examination of the fetal heart will include at least one m-mode image of the heart rhythm with a calculated heart rate. At least one view of the four chambers shall be included and labeled *4 Chamber Heart*. An image should be included that demonstrates the orientation of the fetal heart and position within the fetal thorax. Images of the heart can be obtained from the apical or lateral projection and should be magnified to occupy at least ½ of the field of view. The 4 chamber view must demonstrate symmetry of the ventricular chambers and symmetry of the atrial chambers. The ventricular and atrial septa and crux will be included. The moderator band should be visible in the right ventricle and the septum primum (flap of the foramen ovale) in the left atrium. A long axis image of each ventricular outflow tract should also be obtained and labeled *LVOT or RVOT*, as appropriate. A 3-vessel view should also be captured and labeled *3 Vessel View*; consisting of the long axis pulmonary artery/ductus arteriosus, short axis ascending aorta and short axis superior vena cava. A transverse cine sweep from the upper abdomen (to include the stomach) through the great vessels should be included in each examination, demonstrating the 4-Chamber View, LVOT, RVOT/3-Vessel View. When visualized in the course of a normal examination, the aortic and ductal arches may also be imaged and labeled *Ao Arch or Ductal Arch* as appropriate.

- **Stomach:** At least one transverse view of the upper fetal abdomen will include the stomach and be labeled *Stomach*.

- **Kidneys:** At least one transverse image of the fetal kidneys will be recorded to include the renal pelvis on each side labeled *Kidneys*. The kidneys should be
imaged when they are exposed to the examining transducer without intervening fetal tissues (i.e. fetal prone position.) Images of the fetal spine that adequately demonstrate both kidneys are satisfactory for documentation. If dilated, the renal pelves should be measured in their maximal anteroposterior intrarenal diameter.

- **Bladder:** At least one transverse image of the urinary bladder will be recorded and labeled *Bladder*.
- **Umbilical cord vessels and insertion sites:** A transverse color Doppler image of the intrapelvic umbilical arteries (adjacent to the fetal urinary bladder) should be obtained. If this is not well seen, a cross-sectional image of the umbilical cord demonstrating the umbilical arteries and vein can be obtained instead. Any images demonstrating two umbilical arteries should be labeled *3 Vessel Cord*. At least one transverse image of the anterior abdominal wall at the fetal umbilical cord insertion will be recorded and labeled *Cord Insertion*. This is best demonstrated with fluid opposing both surfaces of the cord and abdominal wall. The placental cord insertion should also be evaluated, and a representative image obtained and labeled *Cord Insertion Placenta*. If the placental cord insertion site is less than 2 cm from the placental margin (marginal cord insertion), then a measurement of the distance between the two structures should be documented.
- **Extremities:** Documentation of the extremities should demonstrate the presence of both arms and legs. Images of upper extremities will be labeled *Rt/Lt Humerus, Radius/Ulna or Arm*, as appropriate. Images of lower extremities will be labeled *Rt/Lt Femur, Tib/Fib or Leg*, as appropriate. Images of the lower legs should demonstrate the presence or absence of clubbed foot/feet.

**PATHOLOGIC CONDITIONS:** When pathologic processes are detected during the course of the examination, extra images are necessary to characterize the abnormality. One or more cine clips should be obtained of any detected pathology. The following is a description of commonly encountered conditions that should be considered during the examination and the minimum additional stored images expected for each circumstance. The list is not intended to be comprehensive, and sonographers are expected to apply their knowledge of maternal and fetal anatomy to provide clear images of the abnormalities they encounter. Some conditions and structures may be best imaged from an endovaginal approach or require color and/or spectral Doppler for optimal characterization.

**Intrauterine Growth Restriction (IUGR):** IUGR is defined as an estimated fetal weight (EFW) below the 10th percentile for gestational age GA. There are two subtypes: symmetrical and asymmetrical.

Symmetrical IUGR is where all fetal biometric parameters tend to be less than expected for a given gestational age, resulting in a low EFW. These fetuses may present at an earlier stage than those with asymmetrical IUGR. Symmetrical IUGR commonly results from aneuploidy, infections or maternal drug exposure.

Asymmetrical IUGR occurs when some fetal biometric parameters are disproportionately lower than others, resulting in a low EFW. The parameter classically affected is the abdominal circumference. Asymmetrical IUGR is the more common subtype, but frequently does not present until the 3rd trimester. Asymmetrical IUGR is often caused by placental insufficiency and less commonly, pre-eclampsia.
Fetal tachycardia and oligohydramnios are commonly associated with IUGR. As placental insufficiency is the leading cause of IUGR, placental vascular resistance should be assessed in all known or suspected cases of IUGR. The degree of vascular resistance at a given gestational age can be used to manage the pregnancy. The umbilical artery should be assessed using spectral Doppler. Samples should be measured at three different locations within free segments of the umbilical cord. A ratio of systolic to diastolic velocities (S/D ratios) should be calculated and the average of the three reported. Spectral Doppler interpretation is dependent on gestational age; high resistance waveforms are normal in the early second trimester. Absent or reversed diastolic flow is abnormal.

*It is important to have the spectral Doppler wall filter set low enough to display very low velocity flow; not doing so could result in a waveform that falsely indicates the absence of end diastolic flow or even a waveform that hides the presence of subtle flow reversal.

**Placenta previa:** Every 2nd/3rd trimester screening obstetrical ultrasound will demonstrate the placental relationship to the cervix. If a normal placental-cervix relationship is previously demonstrated, then it is not necessary to re-evaluate on subsequent obstetrical exams within the same pregnancy. Maternal factors that may predispose to placenta previa (age, parity, previous cesarean section, prior previa) and vaginal bleeding should be noted in the patient history. The cervix should be imaged when the urinary bladder is empty or mildly distended and the presenting fetal part displaced from the lower uterine segment to permit unobstructed sagittal views of the inferior margin of the placenta and the cervix in a single image. Contractions of the lower uterine segment should be allowed to relax prior to imaging. At least two sagittal images demonstrating the placental-cervix relationship should be obtained and labeled *Long Cervix.* If the placenta is implanted over the internal os, images should document the relative volume of placenta on each side of the os (i.e. anterior and posterior.) If the placenta is implanted within 2 cm of the internal os (low-lying), images should clearly demonstrate the inferior edge and internal os, with a measurement of the distance between the two recorded on the image. If there is a venous sinus or cord vessels on or near the leading edge of the placenta, color Doppler images should be obtained to clearly demonstrate the position of the vessels relative to the internal os. When diagnostic evaluation of the placental-cervix relationship cannot be adequately performed transabdominally (e.g. low position of the fetus, obese patient), a transvaginal approach should be employed. As a pregnancy progresses, placental migration away from the internal os is common. Therefore, re-evaluation of a low-lying placenta or mild complete previa is warranted, especially if initially demonstrated in the early 2nd trimester.

**Placental abruption:** Patients at risk for placental abruption (vaginal bleeding, pelvic pain, labor, premature rupture of membranes, trauma) shall be examined with attention to the placental implantation. Specific evidence of subplacental or subchorionic hematoma shall be sought, documented, and labeled *long right or left and transverse* as appropriate. The umbilical cord insertion into the placenta shall be identified (if not obstructed by the fetus) and recorded. When a follow-up examination of placental abruption is requested, the sonographer shall review the original exam and attempt to reproduce similar imaging planes to allow comparison of the hematoma size. In pregnancies where a hematoma is documented and >26 weeks, umbilical artery spectral Doppler shall be obtained and recorded (3 separate
images). See IUGR section above for more information regarding umbilical artery spectral Doppler.